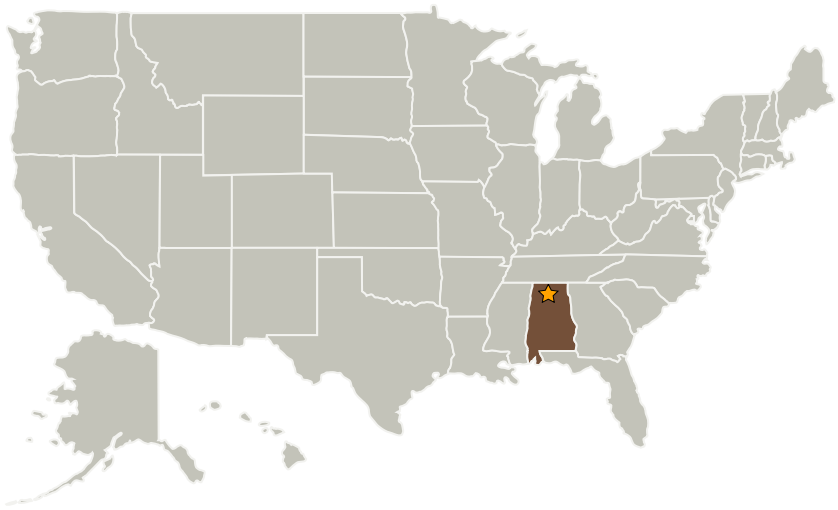
Lightweight Nozzle Extension for Liquid Rocket Engines, Phase II

Completed Technology Project (2009 - 2012)

Project Introduction

The ARES J-2X requires a large nozzle extension. Currently, a metallic nozzle extension is being considered with carbon-carbon composite as a backup. In Phase 1, Plasma Processes Inc. (PPI), with the support from subcontractor ATK Launch Systems, fabricated, coated and test fired Haynes 230 and domestically produced 2-D carbon-carbon nozzle extensions. The test results show coated carbon-carbon intact and Haynes 230 in need of film cooling and emissivity and, or thermal barrier coatings. Oxide emissivity coating reduced the Haynes 230 wall temperature by 500F. In Phase 2, the primary goal will be to develop the optimum thermal solution for a metallic J2X nozzle extension. Working with Pratt & Whitney Rocketdyne, high emissivity and thermal barrier solutions will be demonstrated on successively larger components until full size capability is demonstrated. A secondary goal is to continue the demonstration of domestically produced 2-D C/C composite nozzle extension materials and oxygen protective liners for use on liquid rocket engines. The team of Plasma Processes, Inc., Pratt & Whitney Rocketdyne and ATK Launch Systems offers the state of the art skill set that is uniquely suited to the Phase 2 program.

Primary U.S. Work Locations and Key Partners



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Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Marshall Space Flight Center (MSFC)

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

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Organizations Performing Work	Role	Type	Location
★Marshall Space Flight Center(MSFC)	Lead Organization	NASA Center	Huntsville, Alabama
Plasma Processes, LLC	Supporting Organization	Industry Veteran-Owned Small Business (VOSB)	Huntsville, Alabama

Primary U.S. Work Locations
Alabama

Project Transitions

January 2009: Project Start

July 2012: Closed out

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Technology Areas

Primary:

- TX01 Propulsion Systems
  - TX01.2 Electric Space Propulsion
    - TX01.2.4 Electrothermal